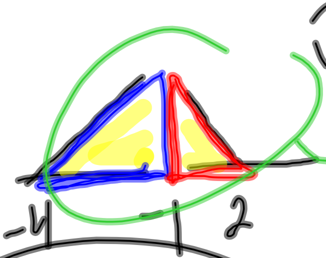
47.

$$\int_3^7 f(x)\,dx = 5 \qquad \int_3^7 g(x)\,dx = 3$$

$$\cancel{\int_3^7 f \cdot g = 15}$$

Nov 19-11:27 AM

15.



$$\bar{y} = \frac{1}{2 - -4} \boxed{\int_{-4}^{2} f(x)\,dx}$$

$$= \frac{1}{6}\left(\frac{1}{2} \cdot 6 \cdot 3\right)$$

$$= \frac{3}{2}$$

$$\bar{y} = \frac{1}{b-a}\int_a^b f(x)\,dx$$

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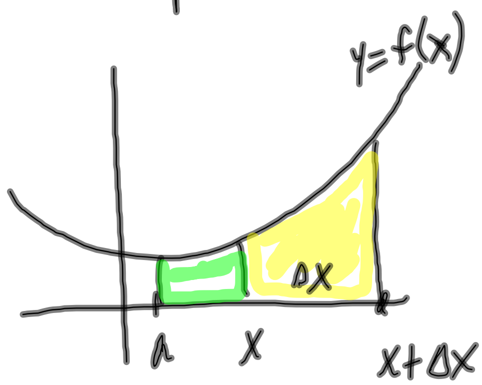
5.4 proof of F. T. C.



ΔF = shaded area

Δx = base

$$\lim_{\Delta x \to 0} \frac{\Delta F}{\Delta x} = f(x)$$

Y

F(x) = area from a to x

$$\Delta F = F(x+\Delta x) - F(x)$$

$$F(x) = \int_a^x f(x)\,dx$$

$$F'(x) = f(x)$$

$$\lim_{\Delta x \to 0} \frac{F(x+\Delta x) - F(x)}{\Delta x}$$

F(x) is an antiderivative of f(x)

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$$\frac{d}{dx} \boxed{\int_{-\pi}^{x} \cos(t)\,dt} = \cos x$$

$$\frac{d}{dx} F(x)$$

$$F'(x) = f(x)$$

$$\frac{d}{dx}\left(\sin t \Big|_{-\pi}^{x}\right) = \frac{d}{dx}\left(\sin x - \sin(-\pi)\right)$$

$$= \cos x - 0$$

$$= \cos x$$

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FTC restated

version I

$$\boxed{\frac{d}{dx}\int_a^x f(t)\,dt = f(x)}$$

version II

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

where $F(x)$ is an antiderivative of $f(x)$

$$F'(x) = f(x)$$

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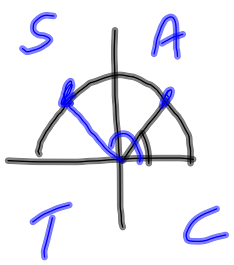
37. $\displaystyle\int_{\pi/4}^{3\pi/4} \csc x \cot x \, dx = 0$

$$-\csc x \Big|_{\pi/4}^{3\pi/4} = -\csc\frac{3\pi}{4} + \csc\frac{\pi}{4}$$

$$= -\frac{1}{\sin\frac{3\pi}{4}} + \frac{1}{\sin\frac{\pi}{4}}$$

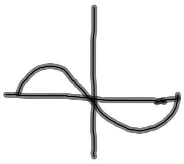


$$= -\frac{1}{\frac{\sqrt{2}}{2}} + \frac{1}{\sqrt{2}/2} = 0$$

Nov 19-12:21 PM

44 Find the total area of the region between the curve & x axis

$y = x^3 - 4x$ $[-2, 2]$ (ok to graph)



$\int_{-2}^{2} x^3 - 4x\,dx = 0$

can't use $\int_{\square}^{\square}$ key

$$\int_{-2}^{0} x^3 - 4x\,dx + \left| \int_{0}^{2} x^3 - 4x\,dx \right|$$

$4 + |-4|$

8

$$\frac{x^4}{4} - 2x^2 \Big|_{-2}^{0} + \left| \frac{x^4}{4} - 2x^2 \Big|_{0}^{2} \right|$$